

ARTICLE BT
(Two-thirds vote)

AMEND ZONING BYLAW – OUTDOOR LIGHTING REGULATIONS

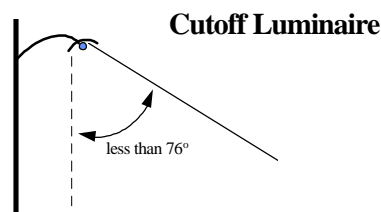
To see if the Town will vote to amend the zoning bylaw as follows [*Notes in italic print are not part of the article but are intended for explanation only*]:

- A. In section 10.4 – Site Plan Special Permit, delete section 10.4.3.2 – Outdoor Lighting and replace it with the following:

10.4.3.2 Outdoor Lighting – Developments and redevelopments requiring a Site Plan Special Permit or an amendment thereof, shall comply with the standards for outdoor lighting set forth in section 10.6.

[*Note: Section 10.4.3.2 contains the graphic shown here and currently reads: 10.4.3.2 Outdoor Lighting – In the area of new construction all outdoor lighting, with the exception of pedestrian lighting with a height of less than eight feet, shall be designed and located so that:*

- 1) the luminaire has an angle of cutoff less than 76 degrees;*
- 2) a line drawn from the height of the luminaire along the angle of cutoff intersects the ground at a point within the development site, and*
- 3) the bare light bulb, lamp or light source is completely shielded from direct view at any point five feet above the ground on neighboring properties or STREETS. Pedestrian lighting with a height of less than eight feet shall be regulated through the Building Commissioner's Office.]*



- B. Insert a new section 10.6 as set forth below:

10.6 Outdoor Lighting Regulations for Site Plan Special Permits. This section uses defined terms that apply specifically in this section. These terms are defined in section 10.6.6 below and are capitalized in addition to the terms defined in section 1.3 of this bylaw. Figures and Tables referred to in this section are located in section 10.6.7 below.

10.6.1 Applicability –

- 10.6.1.1 The following regulations shall apply to all LUMINAIRES, including existing LUMINAIRES, whose LAMP wattage exceeds the values contained in Table 1, Column A, on any LOT undergoing new development, or a major modification or expansion under a Site Plan Special Permit. A major modification, as used here, shall mean that more than 25% of the LUMINAIRES on the LOT are modified, moved or replaced. A major expansion, as used here, shall mean that the number of LUMINAIRES on a LOT increases by more than 25% of the original number.
- 10.6.1.2 LUMINAIRES installed before the effective date of this bylaw shall be maintained or, if necessary, modified, to meet the zoning bylaw applicable at the time of their installation.

10.6.2 Standards

10.6.2.1 LUMINAIRE design and shielding – Any LUMINAIRE whose LAMP wattage exceeds the values in Table 1, Column A, shall be SHIELDED. Any LUMINAIRE whose LAMP wattage exceeds the values in Table 1, Column B shall be FULLY SHIELDED (Figure 1).

10.6.2.2 Control of LIGHT TRESPASS and GLARE –

- a) Any LUMINAIRE whose distance from a LOT line is less than three times its height ($3xH$) shall be SHIELDED so that all DIRECT LIGHT cast in the direction of STREETS, or abutting LOTS that are in Residential or Conservation USE, is cut off at an angle no more than 70 degrees measured from a vertical line directly below the LUMINAIRE (Figure 2). This requirement shall apply to all sides of the LUMINAIRE that emit light toward a LOT line that is less than $3xH$ away from the LUMINAIRE. The cut-off may be accomplished either by the LUMINAIRE photometric properties, or by a supplementary external shield.
- b) Additional shields that are installed to control LIGHT TRESPASS and GLARE as required herein shall be designed so that the parts of the shields that are exposed to the DIRECT LIGHT of the LUMINAIRE and visible from STREETS, or abutting LOTS that are in Residential or Conservation USE, shall have a flat-black, low-reflectivity finish.
- c) LUMINAIRES shall be SHIELDED so that LIGHT TRESPASS onto STREETS is less than 0.8 fc, and onto an abutting LOTS that are in Residential or Conservation USE, including such LOTS abutting on the opposite side of a STREET, is less than 0.3fc. This measurement shall be made with a photometer placed horizontally on the ground at points at the LOT lines. The Lighting Plan (Section 5) shall include calculations demonstrating that this LIGHT TRESPASS criterion will be met.
- d) LUMINAIRES installed on one LOT to illuminate another LOT, or installed in a STREET, railroad, utility, or other right-of-way to illuminate an adjacent LOT, are prohibited. As used in this subsection, LOT shall always mean LOT as defined in section 1.3 of this Bylaw.
- e) No single LUMINAIRE shall employ LAMP(s) exceeding a total of 400 watts, not including power for ballast or transformer.
- f) Strobe and flashing lights, and laser illumination, are prohibited except as allowed under Section 10.6.5 (Exemptions).

10.6.2.3 Hours of operation –

- a) All non-residential OUTDOOR LIGHTING, with the exception of STREETLIGHTS and safety or security lighting as defined herein, may be turned on no earlier than one hour before business hours and shall be turned off no later than 11 PM or one half an hour after close of business, whichever is later.
 - i. Business hours, as used here, is defined as the period of time during which at least one person is present for the purpose of conducting or concluding business on the LOT or in a STRUCTURE on the LOT.
 - ii. Safety lighting, as used here, is defined as lighting to safeguard the movement of persons by foot or by non-motorized vehicles or by vehicles for disabled persons over hazardous footing or in areas that conflict with vehicle traffic, or lighting for the purpose of aiding the visible detection and recognition of other persons. Safety lighting includes lighting for stairs, pedestrian ramps and tunnels, and pedestrian routes that are reasonably expected to be used after business hours.
 - iii. Security lighting, as used here, is defined as lighting to protect BUILDINGS, and property stored outdoors.
- b) Lighting controlled by motion detectors or infrared sensors with an on-time of no more than 10 minutes per activation is exempt from the hours-of-operation restriction. The motion

detector shall be adjusted so that normal movement of vehicles and traffic along a STREET or public right of way shall not cause its activation.

- c) Lighting of recreational facilities must be turned off no later than one half-hour after the end of use.*
- d) Lighting of the United States Flag and public monuments is exempt from these hours of operation provisions.*

10.6.2.4 Special Provisions –

- a) Externally Illuminated Signs – Lighting for externally illuminated signs shall be projected downward from above. The LUMINAIRE shall be SHIELDED and shall comply with Section 10.6.2.2 (Control of LIGHT TRESPASS and GLARE). It shall be focused directly at the sign display area and SHIELDED so that the LAMP is not visible from STREETS, or abutting LOTS that are in Residential or Conservation USE (Figure 3).*
- b) UP-LIGHTING – UP-LIGHTING is prohibited, except for illumination of the United States Flag, a BUILDING facade or a public monument. For any UP-LIGHTING, the LUMINAIRE shall be equipped with shields as necessary and shall comply with Section 10.6.2.2 including subsections b) through f). It shall be focused directly at the area of the target and SHIELDED so that the LAMP is not visible from a STREET, or a LOT that is in Residential or Conservation USE. Building facade illumination shall not exceed 0.25 watts of LAMP power per square foot of facade surface. The Lighting Plan shall specifically demonstrate compliance for any facade or monument UP-LIGHTING*
- c) Illuminated Outdoor Recreation Facilities – Notwithstanding the requirement of Section 10.6.2.1 (LUMINAIRE design and shielding), the illumination of outdoor recreational facilities such as, but not limited to playing fields, pools, rinks, tennis courts, driving ranges, ski areas, or skateboard parks, shall be by either SHIELDED or FULLY SHIELDED LUMINAIRES. Such lighting shall be exempt from Sections 10.6.2.2.a) (seventy degree cut-off), 10.6.2.2.c) (LIGHT TRESPASS), and 10.6.2.2.e) (LAMPS not to exceed 400 watts per LUMINAIRE). The following requirements shall apply to illuminated outdoor recreation facilities:*
 - i. Such SHIELDED LUMINAIRES shall be mounted at sufficient height and aimed so that the brightest part of the beam is elevated no more than 60 degrees above a point directly vertically below the LUMINAIRE (Figure 4). Light poles for recreation facilities may be as high as necessary to adequately illuminate the facility in compliance with the maximum 60-degree elevation angle, but shall not exceed a height of 85 feet. See section 5.3.5.3 of this Bylaw for a special permit to increase pole height.*
 - ii. The LUMINAIRES shall be SHIELDED so that LIGHT TRESPASS onto STREETS, or abutting LOTS in Residential or Conservation USE, is less than 0.8fc. This measurement shall be made with a photometer positioned at the boundary and aimed directly at the LUMINAIRE. The Lighting Plan shall include calculations demonstrating that the LIGHT TRESPASS requirement will be satisfied.*
 - iii. The LAMP shall not be visible from a STREET, or an abutting LOT that is in Residential or Conservation USE. Alternatively, the installer may retain a qualified independent lighting consultant to measure the maximum luminance visible from STREETS, or abutting LOTS that are in Residential or Conservation USE. The measurement report shall be delivered to the Building Commissioner and shall demonstrate that the maximum luminance apparent from a STREET, or an abutting LOT that is in Residential or Conservation USE, is not more than 2500 cd/sq.m.*
- d) LUMINAIRES in a Local Historic Districts – In Local Historic Districts, LUMINAIRES may be exempted from Section 10.6.2.1 (LUMINAIRE design and shielding) if the Historic District Commission specifically requires LUMINAIRES of a type that is not available in a*

version that meets the FULLY SHIELDED criterion. In such cases, such LUMINAIREs shall comply with IESNA CUTOFF light distribution standards.

Illumination for externally illuminated signs in a Local Historic District may be from below using UP-LIGHTING from SHIELDED LUMINAIREs. In this case, the LAMP shall not be visible from a STREET, or from an abutting LOT that is in Residential or Conservation USE, and shields shall comply with Section 10.6.2.2 b) (Visible part of shield has flat-black finish).

10.6.3 Total Site Power Limits

10.6.3.1 This section regulates the total amount of lighting that may be used on a LOT. For simplicity, this is accomplished through regulation of the total amount of outdoor LAMP watts installed on the LOT, instead of the total lumen output. An OUTDOOR LIGHTING installation complies with this section if the actual Total Installed Watt Ratings of all LAMPS is no greater than the Allowed Lighting Power. Ballast and transformer power is not counted in this total.

10.6.3.2 The Allowed Lighting Power shall be the sum of contributions calculated according to the Activity Areas listed in sections 10.6.3.2 a) through f) below. Only those spaces on a LOT, which are covered with impervious materials, shall be counted towards Activity Areas. Activity Areas on a LOT shall be clearly marked and labelled on the Site Plan. There shall be no overlapping Activity Areas. For a space to be included in the total of an Activity Area, a LUMINAIRE must be within 100 feet of any such space.

- a) Parking lots, driveways, walkways, bikeways – 0.08 watts per square foot of the area of parking lots, driveways, walkways, bikeways, and any other outdoor impervious surfaces on the LOT. These Activity Areas include a 5-foot wide margin of grade or landscaping around the impervious surfaces.*
- b) BUILDING entrance areas – 13 watts per linear foot of the width of all doors, plus six feet per door.*
- c) BUILDING CANOPIES – 0.4 watts per square foot of the ceiling area of walkway CANOPIES. For portions of BUILDING walkway CANOPIES extending over an entrance area, the Allowed Lighting Power may be regulated by section 10.6.3.2.b) above.*
- d) Retail sales CANOPIES: 0.9 watt per square foot of the ceiling area of service station and retail sales CANOPIES. Retail sales CANOPIES are covered spaces that are used for display or dispensing of products for sale.*
- e) Retail sales frontage – 20 watts per linear foot of sales frontage. Sales frontage is measured along the edge, as viewed from a STREET, of a paved or otherwise improved area used exclusively for the display of vehicles or other large objects for sale. For this purpose, sales frontage shall be assumed to be 20 feet deep.*
- f) OUTDOOR SALES AREA – 0.8 watts per square foot times the area of the OUTDOOR SALES AREA. This area shall be specifically for the display and storage of vehicles, structures, or other large objects offered for sale, and shall not include driveways, walkways, service areas, storage, or other uses.*

10.6.3.3 Unlit areas of the LOT may not be used to calculate Allowed Lighting Power. An illuminated area of the LOT is defined as within 100 feet of a LUMINAIRE on the LOT, or, if under a CANOPY, within 25 feet of a LUMINAIRE mounted under the CANOPY.

10.6.4 Lighting Plan

10.6.4.1 A Lighting Plan shall be included in all applications for a Site Plan Special Permit that proposes new or replacement lighting installations. For initial developments of land, a major modification (more than 25% of LUMINAIREs being modified or replaced), or a major addition (more than 25% increase in the number of LUMINAIREs), this lighting plan shall be certified to be valid and correct by its designer. The lighting plan shall contain:

- a) On the site plan – the location, height, shielding type of all existing and proposed outdoor LUMINAIREs, and the wattage rating of all LAMPS in each LUMINAIRE, including BUILDING or CANOPY mounted LUMINAIREs. Any existing off-site LUMINAIREs used to illuminate the LOT shall be included in the Lighting Plan. Activity areas (Section 10.6.3) shall be clearly marked on the Site Plan.
- b) Manufacturer's data – For all LUMINAIREs, whose LAMP wattage is greater than Table 1, Column B, the manufacturer's specification data and technical drawings, including the LUMINAIRE LAMP wattage; photometric data showing that the LUMINAIRE is FULLY SHIELDED, including an electronic copy of the IES photometric file, or a reference to the file location on the manufacturer's web site. Manufacturer's photometric specification that the LUMINAIRE is rated IESNA Full Cutoff (FCO) is sufficient to show that it is FULLY SHIELDED. For all LUMINAIREs whose LAMP wattage is less than values shown in Table 1, Column B but greater than values shown in Table 1, Column A, the manufacturer's specification data and technical drawings showing that it meets the definition of SHIELDED LUMINAIRE.
- c) The data of previous sections a) and b) shall be organized into a table, with one line per LUMINAIRE.
- d) Calculations showing that the maximum LIGHT TRESPASS allowed, Sections 10.6.2.2.c) (Light Trespass) and 10.6.2.4.c) (Outdoor Recreational Facilities), will be satisfied by the design.
- e) Calculation of the Allowed Lighting Power for the LOT according to Section 10.6.3 (Total Site Energy [Power] Limits). Activity areas (Section 10.6.3) shall be clearly marked on the Site Plan.
- f) Calculation of the Total Installed Lighting Power from the LUMINAIREs proposed for installation on the Lighting Plan plus any existing LUMINAIREs intended to remain in use, and demonstration that Total Installed Lighting Power does not exceed the Allowed Lighting Power.

10.6.4.2 Submission and subsequent approval of a plan does not relieve the applicant of responsibility to demonstrate conformity to all sections of this bylaw, both in the individual LUMINAIREs as built, and for the entire LOT as built. The designer shall submit an as-built plan that correctly reflects the as-built installation, and shall certify that the as-built installation conforms to the requirements of this bylaw.

10.6.5 Exemptions – The following lights shall be exempt from the standards of this bylaw:

10.6.5.1 Internally illuminated signs.

10.6.5.2 Temporary holiday lighting.

10.6.5.3 Emergency lighting such as used by the Police, Fire Department, or other official or utility emergency personnel. Placement of longer-term emergency lighting shall, to largest extent possible, take into consideration the detrimental effects of GLARE on passing motorists and pedestrians, and on residential LOTS.

10.6.5.4 Temporary lighting used on construction sites. All such lighting shall be placed and directed to minimize the detrimental effects of GLARE on passing motorists and pedestrians, and on residential LOTS.

10.6.5.5 Lighting during special events such as fairs, celebrations, or concerts sponsored by the Town of Acton or authorized by the Acton Board of Selectmen. Lighting for festivals and carnivals is exempt but should be in keeping with the intent of this ordinance.

10.6.5.6 Warning and alarm lights that alert to a malfunction or emergency situation.

10.6.6 Definitions

- **CANOPY** - an opaque ceiling over installed lighting.
- **CUTOFF (CO)** – A LUMINAIRE light distribution, specified by the IESNA, where the intensity in candela per 1000 LAMP lumens does not numerically exceed 25 (2.5%) at a vertical angle of 90 degrees above nadir, and 100 (10 %) at a vertical angle of 80 degrees above nadir. Nadir is the point directly vertically below the LUMINAIRE. A FULL CUTOFF (FCO) LUMINAIRE is also a CUTOFF LUMINAIRE.
- **DIRECT LIGHT** - Light emitted directly from the LAMP, from the reflector or reflector diffuser, or through the refractor or diffuser lens of a LUMINAIRE.
- **FOOT CANDLE (fc)** - Unit of ILLUMINANCE; One lumen per square foot.
- **FULL CUTOFF (FCO)** - A LUMINAIRE light distribution, specified by the IESNA, where zero candela intensity occurs at an angle of 90 degrees above nadir, and at all greater angles from nadir. Additionally, the candela per 1000 LAMP lumens does not numerically exceed 100 (10 percent) at a vertical angle of 80 degrees above nadir. Nadir is the point directly vertically below the LUMINAIRE. A FCO LUMINAIRE is FULLY SHIELDED.
- **FULLY SHIELDED**: constructed in such a manner that no light emitted by the fixture, either directly from the LAMP or a diffusing element, or indirectly by reflection or refraction from any part of the LUMINAIRE, is projected above a horizontal plane passing through the lowest direct-light-emitting part of the LUMINAIRE. (Figure 1). BUILDING CANOPIES, overhangs, roof eaves and similar types of construction shall not be considered as the means for providing the FULLY SHIELDED light cut-off characteristic. This shall be achieved by the LUMINAIRE itself. (Figure 5)
- **GLARE** -The sensation of visual discomfort or loss in visual performance and visibility produced by luminance within the visual field that is sufficiently greater than the luminance to which the eyes are adapted.
- **INDIRECT LIGHT** - DIRECT LIGHT that has been reflected off surfaces other than the source LUMINAIRE.
- **IESNA or IES** - Illuminating Engineering Society of North America. A professional association of lighting engineers and lighting manufacturers generally recognized as the definitive source for illumination recommendations in the United States. An IES photometric file is defined by IESNA standards.
- **ILLUMINANCE** – The luminous flux incident per unit area, expressed in FOOT CANDLE (one LUMEN per square foot). Horizontal or vertical ILLUMINANCE is that measured with a photometer cell mounted horizontally or vertically.
- **LAMP** – The light source component of a LUMINAIRE that produces the actual light.
- **LIGHT TRESPASS** – DIRECT or INDIRECT LIGHT produced by an artificial light source and which shines outside the boundaries of the LOT containing the LUMINAIRE.
- **LUMINAIRE** – A complete OUTDOOR LIGHTING unit or fixture including a LAMP or LAMPS, together with the parts designed to distribute the light, to position and protect the LAMPS, and to connect the LAMPS to the power supply, but not including a pole on which the LUMINAIRE may be mounted.
- **OUTDOOR LIGHTING** – The night-time illumination of an outside area or object by a LUMINAIRE located outdoors. LUMINAIRES under a CANOPY are considered outdoor lights and are regulated by this bylaw.
- **OUTDOOR SALES AREA** – A static display of goods for sale at night, such as automobile sales lots, landscaping and nursery businesses, outdoor construction materials sales lots, and outdoor activity areas such a miniature golf, family fun centers, and permanent swap meets. An OUTDOOR SALES AREA location is not covered by CANOPIES or other STRUCTURES.
- **SHIELDED** – A LUMINAIRE employing a shield to prevent GLARE or obtrusive light by blocking direct view of the LAMP from a STREET or an abutting LOT that is in Residential or

Conservation USE. The LUMINAIRE shall have a generally downward distribution of light and must have a top shield to minimize upward light.

- STREETLIGHTS – LUMINAIRES installed within a STREET and intended primarily for the illumination of the STREET.
- UP-LIGHTING – DIRECT LIGHT illumination distributed above a 90 degree horizontal plane through the lowest DIRECT LIGHT emitting part of the LUMINAIRE.

10.6.7 Figures and Tables

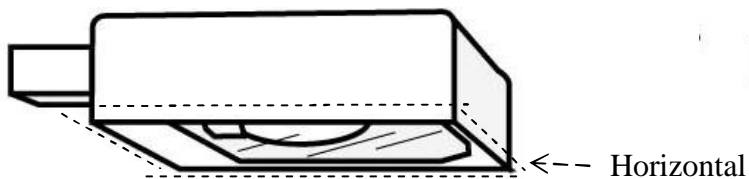


Figure 1A. FULLY SHIELDED. No light emitted above a horizontal plane through the lowest DIRECT-LIGHT-EMITTING part of

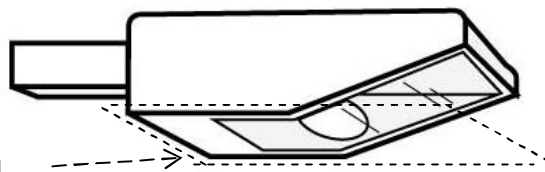
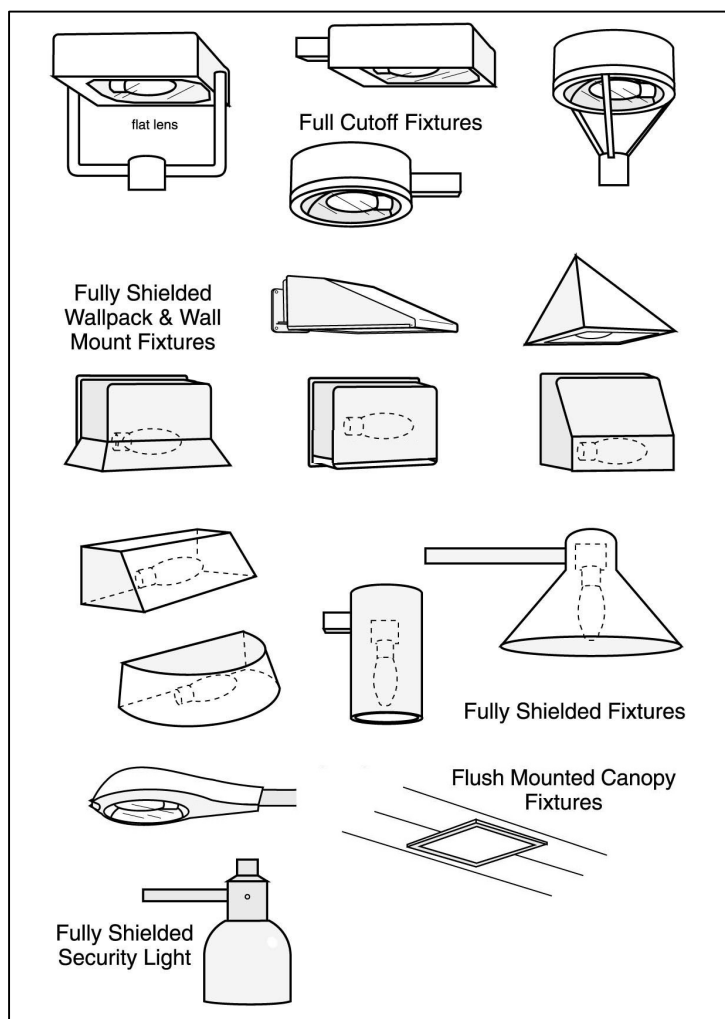
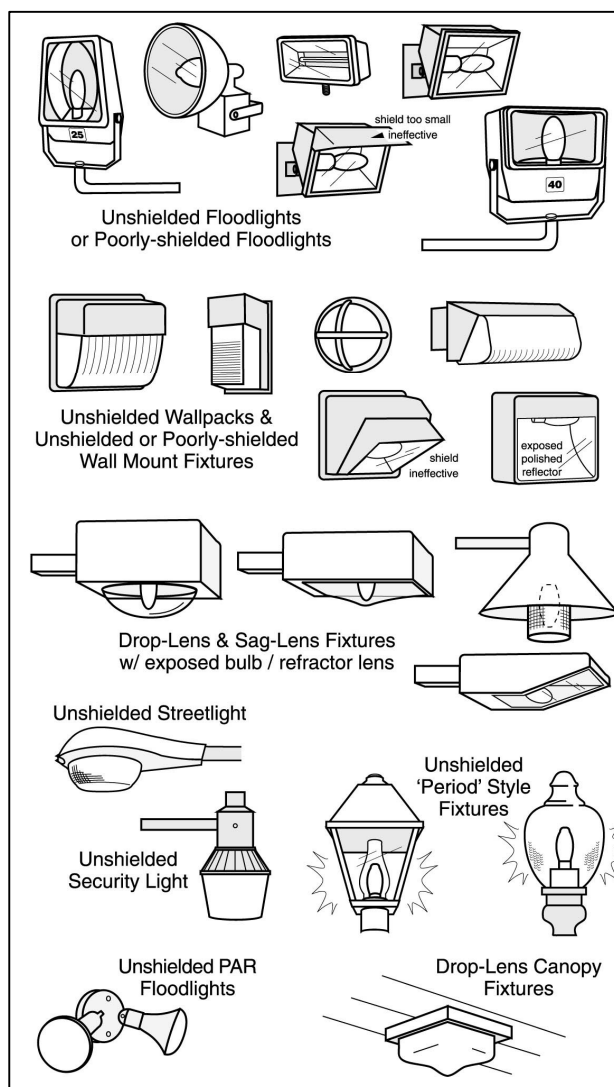


Figure 1B. Not FULLY SHIELDED. Light is emitted above a horizontal plane through the lowest DIRECT-LIGHT-

Examples of FULLY SHIELDED



Examples of LUMINAIRES that are NOT FULLY SHIELDED



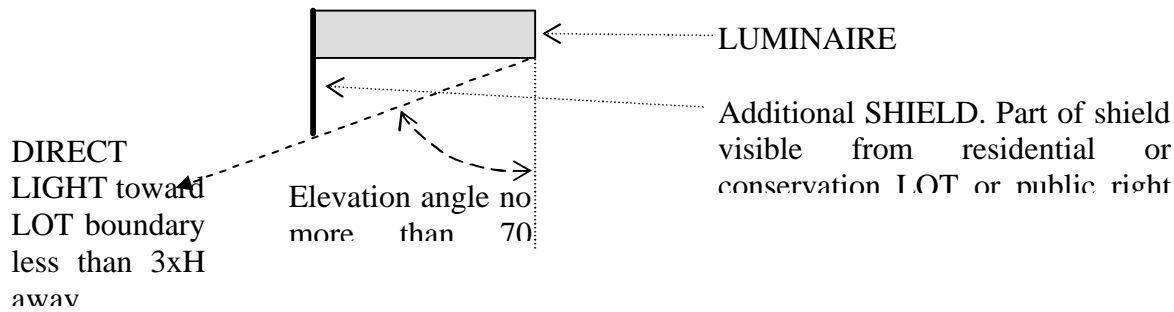


Figure 2. Any outdoor LUMINAIRE whose distance from the LOT boundary is less than three times its height shall be shielded so that all DIRECT LIGHT cast in the direction of residential or conservation lots and public rights-of-way is cut-off at an angle no more than 70 degrees measured from a shield line directed below the LUMINAIRE

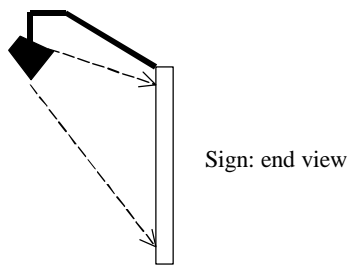


Figure 3. Lighting for externally illuminated signs shall be projected downward from above. The LUMINAIRE shall be SHIELDED and shall comply with Section 3.2 (Control of

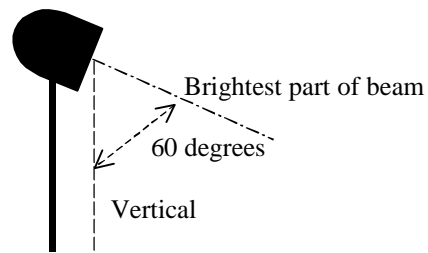


Figure 4. Illumination for outdoor recreational facilities shall be SHIELDED LUMINAIRES and shall be mounted at sufficient height and aimed so that the brightest part of the beam is elevated no more than 60 degrees above a point directly vertically below the LUMINAIRE (Figure 4)

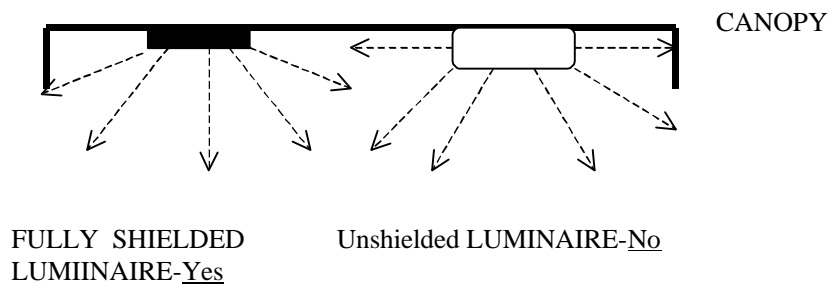


Figure 5. Building canopies, overhangs, roof eaves and similar types of construction shall not be considered as the means for providing the light cutoff. The cutoff characteristics shall be achieved by the

Table 1. LUMINAIRES whose LAMP wattage exceeds the values in Column A of this table shall be SHIELDED. LUMINAIRES whose LAMP wattage exceeds the values in Column B of this table shall be FULLY SHIELDED.

<i>Lamp type</i>	<i>A; SHIELDED</i>	<i>B; FULLY SHIELDED</i>
<i>Incandescent, Halogen</i>	<i>60 w</i>	<i>120 w</i>
<i>High Pressure Sodium, Metal Halide, Mercury Vapor, other HID</i>	<i>35 w</i>	<i>35 w</i>
<i>Fluorescent, Low Pressure Sodium</i>	<i>13 w</i>	<i>20 w</i>

C. Insert a new section 5.3.5.3 as follows:

5.3.5.3 In all Districts, the Planning Board may by special permit increase the height limits in the Table of Standard Dimensional Regulations for light poles that illuminate outdoor recreation facilities such as, but not limited to, playing fields, pools, rinks, tennis courts, driving ranges, ski areas, or skateboard parks that are operated as a Recreation, Municipal, or Commercial Recreation USE. In considering a special permit, the Planning Board shall take into account the trade-offs between the height of light poles and the improved illumination of the facility, and it shall weigh any mitigating effects on light trespass and glare. The luminaires on such light poles shall comply with section 10.6.2.4.c) of this bylaw. No such light poles shall exceed a height of 85 feet.

D. Delete Section 7.4.3.3 and replace it with a new section 7.4.3.3 as follows:

7.4.3.3 Except as otherwise provided herein, illumination for any SIGN shall be provided through a stationary external light source, with the light projected downward from above and in compliance with section 10.6.2.4.a) of this bylaw. In no case shall the illumination of a SIGN cause blinding or otherwise obstruct the safe vision of any traffic participant anywhere. SIGN illumination through an external source shall always be white or off-white.

[Note: Section 7.4.3.3 currently reads: 7.4.3.3 Except as otherwise provided herein, illumination for any SIGN shall be provided through an external light source which shall be stationary, and concealed or hidden so that it is invisible from any abutting property and practically invisible to the casual passerby on or outside the LOT. Such light source shall be directed primarily onto the SIGN and maintained at a sufficiently low intensity and brightness to avoid glare. In no case shall the illumination of a SIGN cause blinding or otherwise obstruct the safe vision of any traffic participant anywhere. SIGN illumination through an external source shall always be white or off-white.]

, or take any other action relative thereto.

SUMMARY

This article, if adopted, would provide new regulations for permanent outdoor lighting on commercial sites in Acton. The proposed regulations would apply to the development of new commercial properties and to substantial redevelopment or expansion of existing commercial properties. The article proposes to regulate the design of outdoor lighting installations to prevent light trespass and glare, the hours during which outdoor lights may be turned on, and the total light power used on a site. A detailed lighting plan would be required as part of all site plan special permit applications. The article proposes changes to the regulation of sign illumination to limit external illumination of signs only from a shielded light source above the sign. For outdoor recreation facilities, the article proposes special lighting design standards and

a height exemption for pole mounted lighting. Both measures would reduce light trespass from illuminated outdoor recreation facilities while also improving the illumination of those facilities. Because this article would only regulate outdoor lighting in new commercial developments or significant commercial redevelopments, it is presented for Town Meeting's consideration together with a companion article for a general bylaw that would regulate the hours of operation of all existing and new outdoor non-residential lighting installations.

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Board of Selectmen:

Finance Committee:

Planning Board: